U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject:	Action: Review and Concurrence, Equivalent Level of Safety for FAA project ST2967AT-T	Date:	November 15, 2001
From:	Manager, Atlanta ACO, ACE-115A	Reply to Attn. of:	Linda Haynes, ACE-118A
To:	Manager, Transport Airplane Directorate ANM-100	ELOS Memo #:	ST2967AT-T-A-1

Background

Sections 25.785(h)(6) (amendment 25-88) and 121.311 (by reference to § 25.785) require flight attendant seats to be equipped with a restraint system that combines a lap belt with a shoulder harness assembly. The lap belt and shoulder harness must be combined so that there is a single point of release.

Delta Air Lines has proposed an installation on the flight attendant seats located on the aft ventral door of the McDonnell Douglas Models MD-88 and MD-90 of a shoulder harness with fixed attachments at the shoulder area and the lower, lumbar region, combined with a separate lap belt. Length of the shoulder straps is manually adjusted with a slider on each harness strap. This arrangement would require more than a single action to completely free the seat belt/shoulder harness to allow flight attendant egress.

The current Delta MD-88 and MD-90 configuration consists of shoulder straps that are anchored in the lower lumbar region, with an inertial reel for each strap at the upper shoulder area. This design allows the shoulder straps to be readily loosened when pulled by hand or by flight attendant shoulder motion during egress. No separate action is required to loosen the shoulder straps. There is a separate lap belt with its own buckle release.

Applicable regulations
14 CFR 25.785, 14 CFR 121.311

Regulation(s) requiring an ELOS

The single point release requirement was incorporated into 14 CFR § 25.785 (h), by Amendment 25-51, effective March 6, 1980. The certification basis for the MD-88 is pre-amendment 51. However, 14 CFR 121.311, contains requirements for the single point release based on 25.785, effective March 6, 1980. The certification basis for the MD-90 for § 25.785 is up to amendment 25-70. The effective requirement for § 25.785 would have been 25-64, effective June 16, 1988, which contains the requirement for single point release in § 25.785(h).

Currently, § 25.785(h)(6), amendment 25-88 contains the requirement for single point release. This is the amendment level to which the equivalent level of safety was found.

Description of compensating features which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

No compensating design features were required.

Explanation of how features provide an equivalent level of safety to the level of safety intended by the regulation

The guidance for complying with the requirements of § 25.785 for flight attendant restraints is included in Advisory Circular (AC) 25.785-1A, which states that a single point release is one requires only one action to mechanically unlatch the restraint system (which includes the lap belt and shoulder harness). AC 25-17 similarly requires a single point release to allow one action to release the lap belt and shoulder harness simultaneously.

The purpose of the single point release requirement is to ensure there will be no significant impediment to the flight attendant egressing the seat and assuming their emergency evacuation duties. The typical means for complying with the single point release requirement is to terminate the shoulder straps in the lap belt buckle, wherein the shoulder straps would be released when the buckled is opened. Another design ties each shoulder strap to the lap belt so that release of the lap belt indirectly releases the shoulder harness.

The requirement for a single point release was adopted as part of an overall upgrade to flight attendant seating in Amendment 25-51, which also included requirements on location, direct view and occupant protection. In describing the location requirements for flight attendant seats, Advisory Circular (AC) 25.785-1A quantifies the "near a required floor level emergency exit" requirement of FAR 25.785(h)(1) as being no more than three longitudinal seat rows away. In addition, the AC says that, when more than one approved seat location is within the three row distance, the flight attendant can be located in a seat other than the one closest to the exit if ". . . the design of the seat(s) further from the exit has increased occupant protection features over the seat(s) closest to the exit." This guidance indicates that, under certain circumstances, increased protection for the flight attendant can compensate for a small increase in egress time, since proximity to the exit (noted in the guidance above) can also affect egress time.

The fixed shoulder strap design that Delta is proposing would require the flight attendant to first release the lap belt, and then reach up to release either one or both shoulder harness sliders so that sufficient slack is available to free the shoulders. The additional action of releasing the sliders will slightly increase the time required for the flight attendant to release himself/herself from the restraint system. Balancing this time increase are the following benefits, which would provide increased protection for the flight attendant:

1. Elimination of the potential failure modes of the inertial reel assemblies that could prevent the shoulder harness from providing adequate restraint or, alternatively, from allowing ready egress by not releasing after the crash accelerations.

2. The ability to manually adjust the shoulder harness tension to provide secure restraint is also an advantage over the inertial reels slack retraction mechanism.

The shoulder harness routing and anchor points of the proposed modification are the same as those of the current design, therefore, requirements such as restraint performance, including anthropometric accommodation, under § 25.785 are not at issue. However, performance of the restraint under the conditions specified in § 25.562 would have to be demonstrated, for an airplane with that regulation in its certification basis.

Since the purpose of the single point release requirement is to provide the flight attendants with the ability to readily egress their seats and assume their emergency evacuation duties, the proposed Delta restraint design must be shown to provide an equivalent level of safety to the "single point release" requirements of §§ 25.785(h)(6) and 121.311. This can be shown provided:

a. Delta demonstrates that the fixed adjustment design provides no significant impediment to immediate seat egress and assumption of evacuation duties by the flight attendant. This demonstration must use a range of test subjects that cover an appropriate range of anthropometric sizes, i.e., 5^{th} percentile female to 95^{th} percentile male. The demonstration should be started with the straps adjusted as described in paragraph b. below. Ready egress should be possible no matter what order the flight attendant operates the harness adjustments and lap belt buckle.

b. The fixed adjustment design allows a single shoulder strap tension level that is sufficiently taut to adequately restrain the flight attendant's torso during the crash accelerations but not so tight that the flight attendant cannot perform duties that are typically required while seated with the restraint secured (cabin observation, flight deck communication, etc.).

c. Only a single action is required to release the lapbelt.

ACO recommendation for approving the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in Issue Paper A-1. This memorandum provides standardized documentation of the ELOS that is non-

proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number is listed in the Supplemental Type Certificate.

Linda M. Haynes for

Melvin D. Taylor, Manager
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Concur

Signature: ___Robert Breneman_____
Project Officer, Transport Standard Staff, ANM-110

Date: __December 14, 2001_____